

The status of the East Timor agricultural sector 1999

Narve Rio

WP 2001: 7

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Chr. Michelsen Institute *Development Studies and Human Rights*

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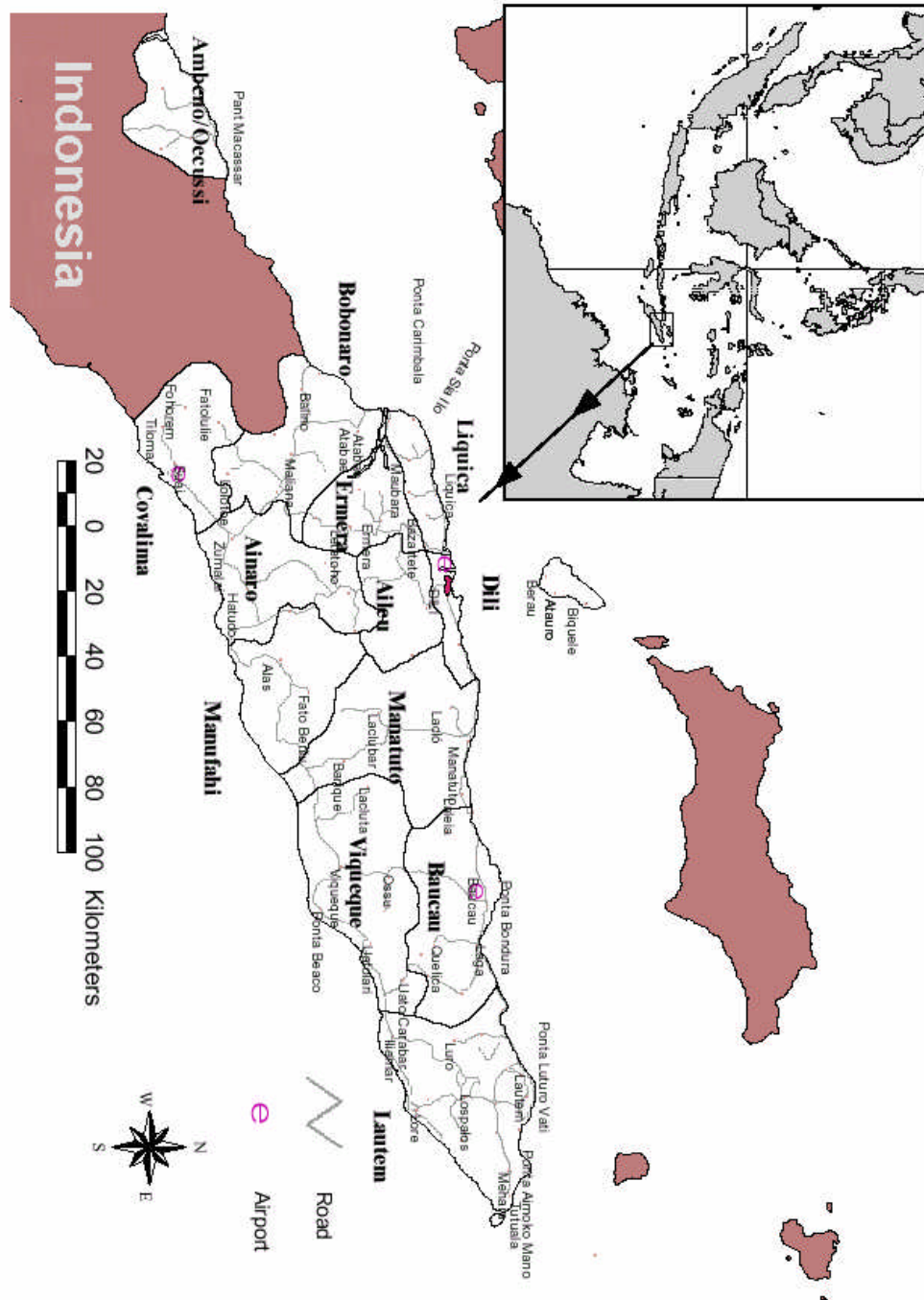
East Timor

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1. Foreword

This working paper came about as a result of background research for a chapter in *Social and Economic Conditions in East Timor*, published by the International Conflict Resolution Program, School of International and Public Affairs, Columbia University, New York USA [Pedersen, 1999]. The paper has been available in its existing form from late 1999.



Map 1 East Timor.

2. Background

In developing countries the agricultural sector is symptomatically large relative to other productive sectors of the economy. In 1997 the agricultural sector in East Timor was by far the largest, suggested in Indonesian public figures to cover 33.66 percent of gross regional domestic product (GRDP) and continues to account for employing about 80 percent of the labour force. I.e. agriculture contributes substantially to the economy and it is to be expected that at least the former figure is an underestimate¹. Food crops are the single most important contributors, with a share to GRDP of about 20%. Second to food crops is non food and estate crops, third is livestock and associated products, and then fishery and forestry follows with only minor shares (Badan Pusat Statistik Propinsi Timor Timur 1998a).

Although the agricultural sectors share has seen some decline lately, losing ground to first and foremost industry such as manufacture and mining, its contribution to GRDP has been growing (Badan Pusat Statistik Propinsi Timor Timur 1998b)². The fastest growing products are those categorised as *farm non food and estate products*, but also food crops and livestock have shown growth measured in current prices over the same time span according to the BPS Tim-Tim (Central Board of Statistics of East Timor Province). In 1996 and -97 there was growth also in real value of agricultural product.

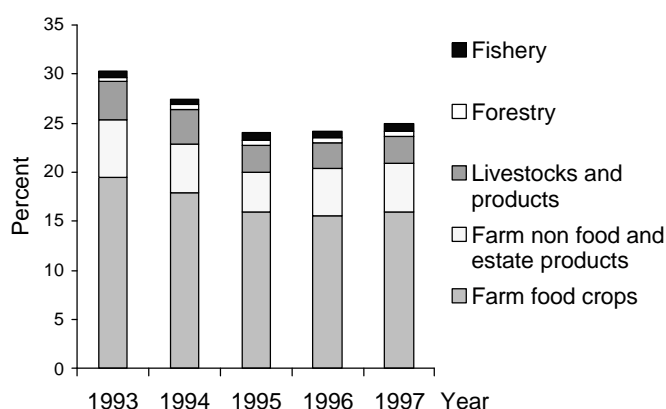


Figure 1 Percentage distribution of contribution to Gross Regional Domestic Product (GRDP) at constant 1993 market prices by origin in East Timor Province. Source: Timor Timur Dalam Angka 1997.

One should nevertheless not mistake this pattern of growth with growing prosperity in the recent years for the district. Reports on the general food supply situation in the province far from encourage this view. Famines have been reported constantly also on Indonesian television during the drought and crisis continuing from mid 1997. Not the least in connection with the 1999 August ballot. As many as 50 – 60% of the population was reported to maintain

¹ From the sources for statistics on this matter it is not possible to get clear and consistent numbers on agriculture's share to GRDP. In the publications from the Central Bureau of Statistics the figure for agriculture's share to GNRDP 1997 was 33.66 percent in current prices. This figure does however not sum up the elements of the agricultural sector. Adding up from food crops through forestry to fishery gives the substantial higher figure of 61,75 percent where food crops stand for 38,63 percent alone (Timor Timur Dalam Angka 1997 and GRDP East Timor Province 1993 - 1997). The figures from BPS (Central Board of Statistics of East Timor Province) are widely used though in literature and reports without considerations.

² It should be noted that in the Central Board of Statistics of East Timor Province publications, the *agricultural sector* contains the following *sub sectors* respectively; *farm food crops*, *farm non food and estate products*, *livestock and products*, *forestry* and lastly *fishery*.

an insufficient diet during the time the UN delegates were observing the ballot. In large parts more than this, up to 80% of the population, suffered malnutrition³. The situation following the ballot has been widely documented and repercussions from these events are awaited into at least the nearest future as it relates to agricultural production patterns and possibilities.

As is common throughout the developing world a large fraction of the agricultural production in East Timor is for subsistence, i.e. for domestic consumption. Many produces never reach a market or are subject to local (semi) bartering. This again means that probably a large fraction of actual agricultural annual yields are to some extent underreported and official figures do not give a complete picture. It is nevertheless clear that East Timor has not been self sufficient in staple food production the last three decades. Rice has been provided inter-insular by among others provincial rice logistics agency (Dolog NTT). Especially during crisis situations such as the 1997-98 drought outside help was crucial. Compared to other regions in the Indonesian archipelago food production in the eastern districts are still low for most staple crops (remarkably so for East Timor along with Maluku and Irian Jaya).

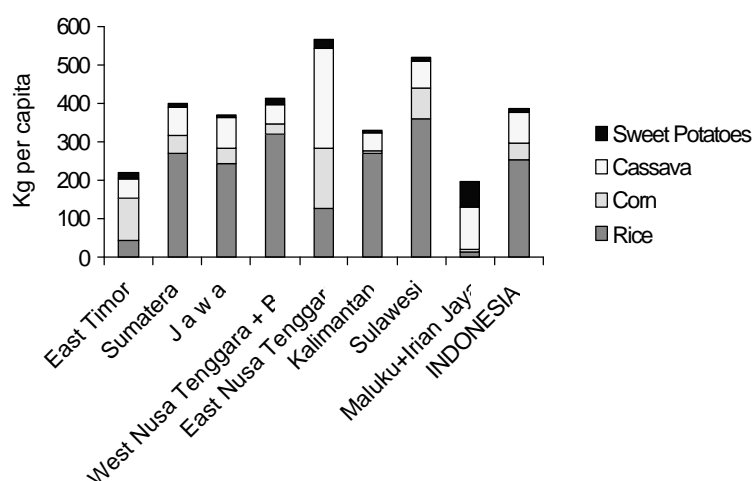


Figure 2 Approximate per capita production of selected food crops in Indonesia. Source: Directorate General of Food Crops and Horticulture.

The Indonesian government spending from development budgets have in this sector been varying over the years. Overall spending is difficult to trace, and consist of sector specific allocations from the departments concerned with agriculture, but the special development funds for East Timor shows figures for rather low priority to agriculture relative to communication sector and sector of government apparatus (Saldanha 1994). Several development projects dedicated to specific crops have been undertaken. Especially the efforts in bringing extensive rice cultivation to this province are worth mentioning. Not only Indonesian programs have been involved, but also foreign aid has been received such as from the American aid program CRS (Catholic Relief Service) in the early eighties and current programs run by USAID (AusAID 1999). Tractors have been introduced as well as irrigation systems, but unfortunately no immediate success has followed these efforts. There have been programs for a number of other crops, food crops and horticulture, such as cassava and corn, coffee, peanuts, cacao and more. Many of these has been highly documented "pilot" projects, aimed at informing future investments in that direction (see for example Cacao cultivation, Regional Investment Coordinating Board of East Timor, 1993).

³ Information from private correspondence with East Timor UN delegate

The development efforts have nevertheless in many cases not been adequate to regain the levels of production from pre-annexation of East Timor. After the annexation there was an important set back of all production as well as reductions in livestock and capital. Also for fishing this was notable. Indonesian needs for controlling the development, i.e. steering it in the direction of integration into the general development of the nation, and also the needs for control in a political sense meant that traditional doings could not be reinstated. There was a wish from the Indonesian rulers to take a grip on most aspects of socio-economic importance, inhibiting the resurrections of traditional activities in agriculture. In this way the process of recuperation was slowed significantly. An additional factor was of course also the lack of capital in most sectors. During the days of war there was a great abrasion on most capital, a capital that in crucial fields were devastated and did not contribute to any starting point for development. If it had been possible for the Timorese population to take up on their traditional agricultural practises after the Indonesian invasion, the capital shortages following the war like situation would have been the main obstacles for development. This was not however what the Indonesian government wanted for East Timor, and a number of reallocations of people and restructuring of production patterns were initiated. The functioning of this policy was nevertheless not successful when it comes to aspirations on the increasing of production. Most likely due to unwillingness to adapt to the new colonising power, fear and injustice, the new structures has proven to be under-performing. It is difficult to say whether it is the small scale of the development efforts in providing capital which is the reason for low performance in the sector, or if marginal benefits from development efforts has been low due to the above mentioned deficiencies regarding political control, relocation and restructuring. It is nevertheless true that efforts in the agricultural sector have been of rather low priority relative to other strategic sectors in the economy.

3. Development of the agricultural sector 1976 – 1999

East Timor province has had special characteristics compared to other provinces of Indonesia. When local administrative matters are considered this becomes of obvious significance for the agricultural sector as well as for the rest of the economy during the implementation phase of Indonesian governing rules. Not only because East Timor was the latest addition to the Indonesian nation, but also because of a desire on the Indonesian hands not to implement in East Timor the degree of autonomy and decentralisation that you find in Indonesia's other provinces.

East Timor province has been consisting of 13 administrative districts (*kabupaten*) that is again divided into 62 subdistricts (*kecamatan*) each including a number of villages (*desa*) all in all totalling 442 villages. Further partition into administrative units exists, consisting of the *dusun* covering smaller settlement areas within the *desa*. This organisational structure is also valid for other provinces of Indonesia. Districts are headed by a *Bupati*, subdistricts are managed by a *Camat* and lastly villages are headed by the so assigned *Kepala Desa*. On top of this is the central body of the Governors (*Gubernur*) office, assigned to be the top authority for implementation of local (regional) government. The Governor has been assisted by several agencies, such as the Regional Development Planning Board (BAPPEDA) and the Regional Investment Coordination Board (BKPM) that are of special relevance for the development of the agricultural sector. Development carried out at a *kabupaten* (district) level has been not only supervised by the Governor but also directly monitored and co-ordinated by assistant Governors (*Pembantu Gubernur*) supervising the *Bupatis*. Three of these Assistant Governor's regions has been formed and functioned to co-ordinate development from the east to the west of East Timor, including the enclave of Ambeno in West Timor. Regional Government of

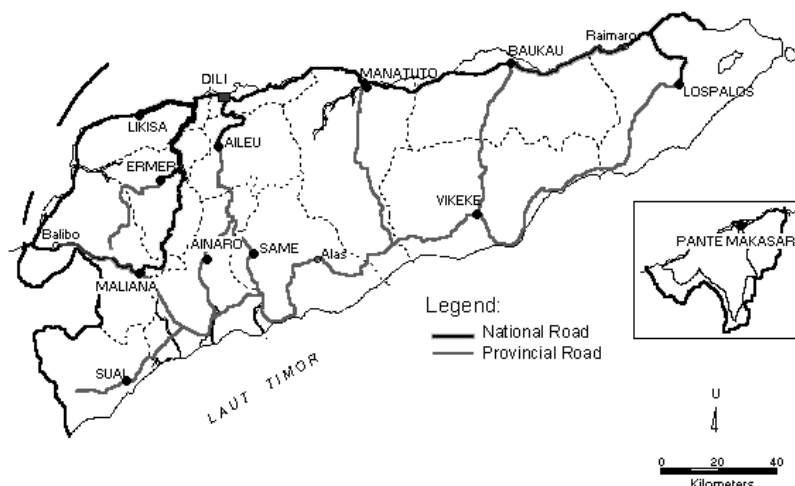
East Timor has been consisting of five bureaus, one covering the sector of agriculture. "Autonomous" regional government tasks has been carried out by technical agencies including different agencies having responsibilities for supervising respectively agricultural food crops, plantation crops and livestock, fishery and forestry. Dili has a special status due to its position as an administrative capital for the province, including the administrative city of Dili itself.

The phases of development and the implementation of Indonesian ruling from 1976 and up to now has been treated to some extent by among few others the Indonesian publication *Timor Timur 20 years of development*. It is nevertheless fair to say that the description of the actual history leading up to today's situation is not adequately relating to the East Timorese majorities experience of the integration and development process. Among other reasons information on actual structures embedded in the real political economy of this and other sectors are therefore not readily accessible. According to *Timor Timur 20 Years of Development* (Brahmana and Emanuel 1996) the Indonesian program relating to the annexation and development of East Timor consisted in the early years of three subsequent phases⁴. The immediate phase of *rehabilitation* (September 1976 - March 1977) was aimed at surveying and the making of inventories for rehabilitation of the conditions that had emerged from the war-like conditions associated with the annexation and the practical standstill in food production and near abolition of livestock. However, few physical development activities were initiated at that time, as most activities were limited to address immediate needs of infrastructure and implementation of Indonesian power structures. The next phase, that of *consolidation* (April 1977 - March 1978), did on the other hand have some implications for long term structures within economic sectors and the political economy of such. The general aim of this phase was to address the arrangements for government implementation and the application of various adjustments of the administrative system according to Indonesian targets for the province. Measures included also physical efforts such as the establishment of markets centrally located in Dili and in the second largest district Baucau. During this stage people was also in great numbers returning from hiding in the mountains. These people were from security reasons concentrated in urban or "safe" areas. More than 200 000 people were in this category, and they were all provisionally housed leading to epidemics and hardship for most. Following this transitional phase a phase of *stabilisation* (April 1978 - March 1979) was initiated, aiming to address the more general foundations for development of the province. In this phase the relevant infrastructure for subordination of development at a distributed level was initiated and in some cases completed. Physical structures that was finished in this period included the addition of 14 public markets and 1 264 km of roads. The agricultural sector was in this period also subject to direct investments from development budgets. Some 580 ha of wet rice fields followed the efforts of establishing a number of simple irrigation networks. There were investments in the introduction of fishponds, rejuvenating of the fleet of fishing boats and also import of cattle livestock, although at a diminutive scale related to pre-war conditions for the case of livestock. It was also in this period of reassuring the security situation the establishments of the village structures and development did see its initiation. The returning of people from hiding continued through this period, following the extensive efforts in hunting down the Fretelin activists in the mountains. Still the returning refugees were located in urban areas and not able to contribute to

⁴ The actual duration for these phases is subject to some discrepancies in literature. In *Timor Timur 20 Years of Development* (Brahmana and Emanuel 1996) the last phase, that of stabilisation, is described to have lasted until 1982 when the phase of short term development took over. In *The Political Economy of East Timor Development* (Saldanha 1994) the same phase is described to have lasted for one year only. There is though consistency for when the following phase of short-term development ended, namely in 1984.

agricultural production. The famine following this development was to some degree relieved by aid from the ICRC and the Catholic Relief Service.

The phase of *short time development* (1979 - 1984) succeeded the phase of stabilisation, further aiming at developing physical structures in East Timor districts and sub-districts. This included the efforts in extensification of agriculture, building on the more advanced or more broadened infrastructure.



Map 2 East Timor main road network. Source: Manipulated from map at The Indonesian Information Services Ministry of Public Works web page (<http://www.pu.go.id/enindexnew98.htm>).

Extensification consisted mostly of new wet field rice areas irrigated by rehabilitated emergency irrigation channels. Some intensification also was initiated, under the guidance of field extension workers. Different systems for managing these new practices was opted for, such as the "techniques of mass guidance" (Bimas) to assist its implementation. During 1983/84 the first co-operatives saw the light of day, established in villages to increase capital and ultimately production of specific crops. Despite these efforts production levels for most crops rather decreased through this phase. This trend was most clearly expressed for traditional product such as coffee, copra (coconut mass) and sandalwood. Most outspoken probably was the decrease in livestock such as for the traditional buffalo. In Indonesian publications this decrease has been assigned to widespread epidemics. It is not clear to what extent this is true or if it has to do with transition problems and the likes. Fisheries are on the other hand reported to have seen some increase during the early 1980thies. An increase mainly stemming from increased capital input in the sector relating to sea fisheries and the instalments of fishing ponds and development of inland and land based fishing.

This phase was also ultimately the last step in preparing the province of East Timor to conform to the system of Five-Year Development Plans (Repelita) of Indonesia. From 1984 East Timor took part in the development plans integrating development into the strategic planning for the provinces. During the first Repelita there was heavy focusing on the development of the agricultural sector. Also results from the short time development phase started to become visible. Some increases in food stocks in the province followed the efforts in intensification and rehabilitation in most districts.

In the initiation phase of the first Repelita also extensification of cropping areas contributed to this trend. In this phase there was a broad focus on agricultural production, plantations, livestock and fisheries. During all of this period agricultural contribution dominated all other

sectors in the economy, and Indonesia realised the position of agriculture as a main priority for development. Still, efforts in this direction did not entirely succeed in keeping up the levels of extensification and intensity over the span of the first Repelita and into the second Repelita. For example the total area of rice paddy decreased subsequently, after the short time development phase, during the first period of Repelita. Through the two programs of Special Intensification (Insus) and General Intensification (Inmum) production of rice started showing some progress again.

The University of East Timor (UNTIM) was founded in this period, in 1985, by the former governor of East Timor. UNTIM is a private university, subsidised by the provincial government and is still the only university existing in East Timor. There is a faculty of agriculture covering subjects of agricultural economics, agronomy and animal husbandry, in addition to faculties of education and social science. The university by now has the responsibility for and is managing a teaching farm initiated in Hera, close to Dili, where in-house training of faculty staff and some senior students have been taking place from 1997. This centre along with other initiatives for faculty training has come as a result of a co-operative project between the UNTIM and The Georgetown University of Australia (The Center for Intercultural Education and Development 1998). Education within agriculture at a higher level is still limited to what is found at the University of Timor (UNTIM). On a lower level there has been vocational courses arranged at three different agricultural extension schools and one agricultural junior school.

By the end of Repelita IV the area of technically irrigated rice had shows significant increases, but overall area for paddy rice had decreased from 20 928 ha in 1984 to 15 635 ha in 1989. During these years the production areas for most crops saw fluctuations of significant sizes, as for corn that in 1985 occupied 49 673 ha decreased to 23 534 ha in 1987 and was back up to 46 401 ha in 1989.

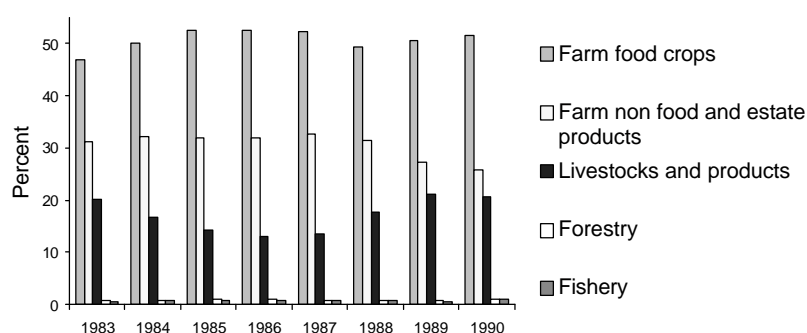


Figure 3 1983 to 1990 composition of contribution from agricultural sector to Gross Regional Domestic Product (GRDP) at constant 1983 market prices by origin in East Timor Province (the columns for each year adds up to 100 %). Source: Saldanha 1994.

A pattern of decrease over the Repelita IV is found also for sweet potato, while the trend for cassava was strictly upwards in this five years planning period. The reasons for these fluctuations are not entirely visible from literature on the subject. It has been suggested that the efforts in development did not entirely match the preferred crops by local farmers. These were typically secondary crops like cassava, sweet potatoes and beans. Symptomatically the traditional staple crop of maize (corn) is in Indonesian literature also defined as a secondary crop when these matters are discussed, and is the crop that saw the most marked fluctuations (Badan Pusat Statistik Propinsi Timor Timur 1998b). This was also a matter of food security for the province. Before the attempted switching to rice as the staple crop East Timor used to

be self sufficient in maize production, even receiving higher yields than most other provinces for the crop at that time⁵. By now East Timor had to import corn and not the least rice to satisfy needs for staple food. Figures for this are not readily accessible, but from registrations of goods unloaded at Dili port in the year of 1997 it included 45 729 ton of rice and 197 ton of corn (Badan Pusat Statistik Propinsi Timor Timur 1998b). This anyway serves to prove that a substantial fraction of all staple foods are still imported. So far the potential land for rice production under higher intensity schemes has not fully been utilised, especially this is true for the security troubled south coast. From security motives the people in this region has been concentrated to certain controllable areas and not been able to fully utilise the lands potential. Irrigation systems are still primitive, with no dams for stocking water, which would be crucial for the capability of cropping twice a year.

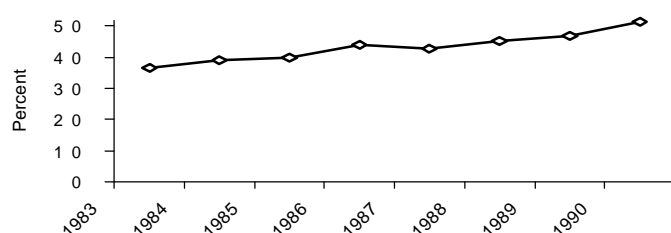


Figure 4 1983 to 1990 development of contribution from agricultural sector to Gross Regional Domestic Product (GRDP) at constant 1983 market prices in East Timor Province. Source: Saldanha 1994.

During the following Repelita V (1989 – 1994) and Repelita VI (1995 – 1999), which better reflects the conditions today or vice versa, efforts in development of the agricultural sector has still been low and even decreasing relative to other sectors in the economy (Saldanha 1994: 166 and 342).

4. Current picture

Currently the agricultural picture is a mixed one. Although data differs among sources it is likely that substantially less than 50% of arable land (suitable land for agriculture) is currently being used. The Indonesian government has estimated that as much as 600,000 hectares may be suitable for agriculture but that only about 40% of this are being used.

	Potential (ha)	Actual area under cultivation (ha)	Percent of potential used
Wet rice	58541	17761	30
Rainfed rice	162435	42695	26
Meadows	208706	79309	38
Plantations	165267	102892	62
Fisheries: Sea water	17		0
Brackish water	20250	31	0
Fresh water	340	84	25
Paddy fields	1124	50	4

Table 1 The potentials for agriculture, including fishery, for East Timor. Source: Timor Timur 20 Years of Development.

⁵ Even though it is disputed whether rice or maize is to be held for the traditional staple crop for the province, East Timor used to be self sufficient in rice production. From Portuguese sources it has been documented that East Timor exported rice in the 50ies (Saldanha 1994).

It is a fact that food production per capita in East Timor is amongst the lowest of the Indonesian provinces. Also a comparison between districts in Nusa Tenggara shows that East Timor is struggling more than other's are. For most of the important crops: rice, maize, cassava and sweet potatoes, there are significant deficits in East Timor's production. Even though there are significant differences in backwardness for the different products, total production overall per capita for East Timor is to compare to Kupang district, a urban and semi urban area in West Timor (the capital of West Timor and Nusa Tenggara Timur).

A direct productivity comparison between all Indonesian provinces for a selection of crops points up these different degrees of backwardness, ranging from almost no difference to severe under-productivity. Remarkably outspoken differences, or backwardness, are found among important crops such as cassava and sweet potatoes. The least differences are found for corn and rice, possibly the most important crops for subsistence needs.

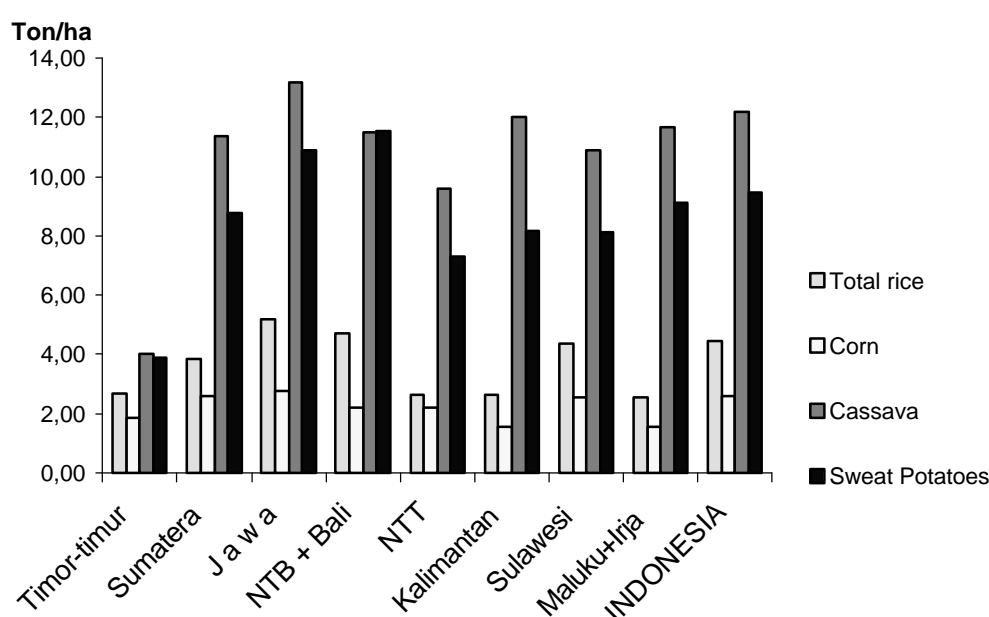
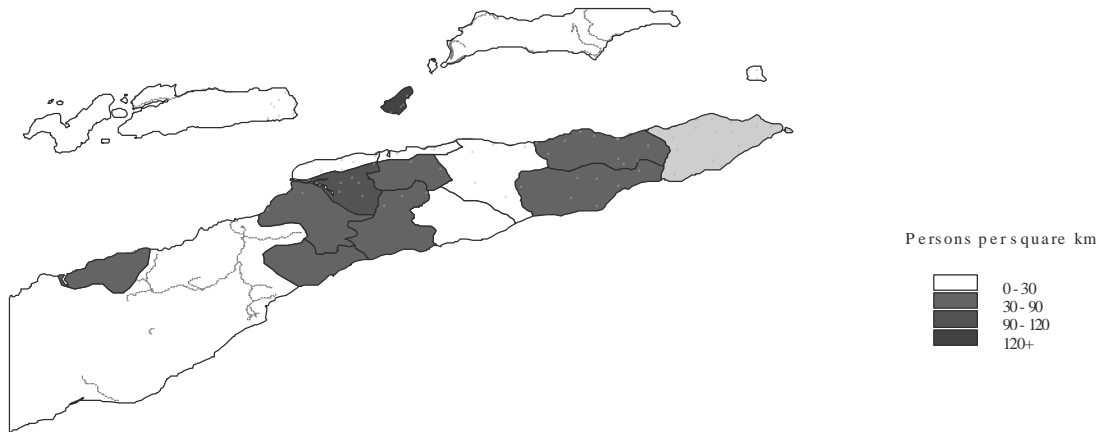


Figure 5 Comparison of crop productivity for selected food crops (ton per ha) over Indonesian provinces, 1997. Source: Statistics Indonesia web page (<http://www.bps.go.id/>).

Population density of East Timor used to be about 60 people per square kilometre (881 600 people on 14 603 km² in 1997). Dili made an exception both with respect to absolute numbers of people and density (174 200 people on 371 km²). Population density varied greatly from Dili to scarcely populated Manatuto, but was overall still in the middle range compared to other provinces of Indonesia (Kalimantan with some 20 people/km², on the island of Java the ratio is about 1000 people/km² and in special province Jakarta more than 15 000). There is also a distinct east-west demarcation line, where cumulatively the districts west of Dili has a population density double of that in the eastern parts.



Map 3 Population density in East Timor 1997 (1996 projection). Source: Timor Timur Dalam Angka 1997.

The more spacious districts of East Timor tend to be more productive than the smaller ones for food crops such as rice, corn and cassava. This goes for both absolute production volumes and production per capita. Remembering that more than 80 % of the population of East Timor depend on agriculture there could be several reasons for this pattern. Firstly, the most populated areas of East Timor coincide with the districts most heavily targeted by Indonesian development efforts. Dili and the surrounding districts of Liquisa, Ailau and Ermera benefited most from the administrative sector based in Dili town, as well as did Bobonaro and Covalima. For these districts there might very well be some kind of land scarcity, and even over-exploitation of the agricultural lands. In these districts control mechanisms has also been more strongly enforced, implying restrictions to movements of the people and giving up on traditional practices. Secondly, in the more remote and spacious districts it is likely that traditional practices has to a higher degree survived and recuperated and that these districts benefits from availability of lands and the robustness of these systems to withstand and cope with difficult situations.⁶

A third aspect also relates to the production capital. Capital supplied to enhance production (mechanisation and technological change) demands a period of follow-up. For example it has been found that by 1997 more than half of the large type tractors, supplied as aid, were broken. I.e. there are indications of that “the government has tried to change too much too quickly, without carefully assessing the merits and dangers of the proposed changes” (Viegas 1999).

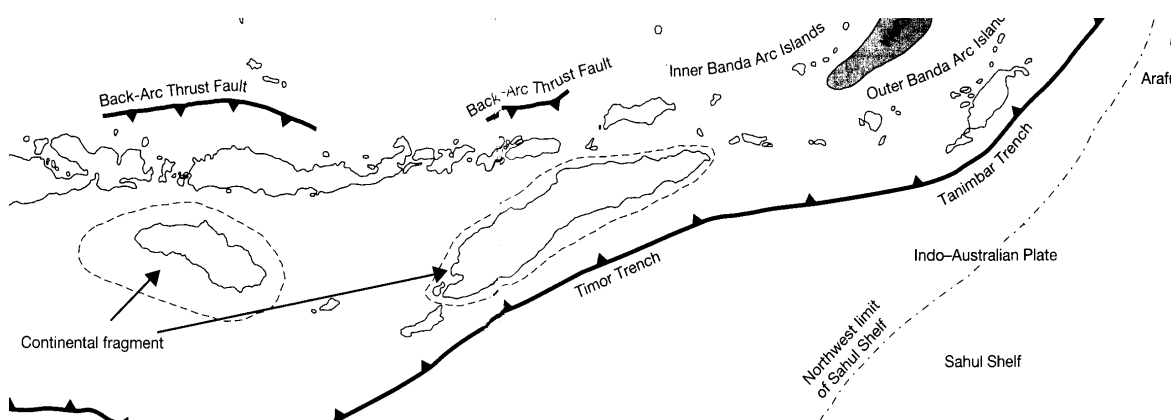
The lack of development within the agricultural sector of East Timor must therefore be explained taking into account several factors. From nature’s side, the island has not as favourable conditions in terms of rainfall and soil quality as other areas of Indonesia. Two and a half decades of wars and civil unrest have had a devastating impact, in terms of lack of market development, input supply and the climate for farmers to undertake long term investments. Agriculture is characterised by subsistence oriented production, limited use of purchased inputs, low productivity and resulting low farm incomes and food production. The problems at hand are most likely best summed up by land tenure (secure rights to the land, i.e.

⁶ It is also a matter of confidence in the figures that are found on the matter, i.e. mainly figures from BPS. For example, if confidence is low the suggested relations could be found to be more significant. I.e. if in the more controlled central areas accounting for agricultural produce is better than the more remote one should expect that the more populated areas are even worse of than indicated by the figures.

legitimate claims to land), land redistribution and land restitution. Land distribution questions are often key issues, which are complicated because there are conflicting claims, conflicting tenure systems, etc, not the least since East Timor has been under colonial ruling by and large for more than 300 years.

4.1. Agro-Ecological zones and potential

A comparison of the East Timors agricultural practises and development with other islands in The Lesser Sunda Islands (Nusa Tenggara) is complicated not only because of its political status, but also due to Timor island's geographical features. The island of Timor is part of a "continental fragment" belonging to the Australian plate, and thereby differs in geological qualities from it's neighbours to the north and north-east. The rest of the Lesser Sunda Islands is mainly volcanic by origin, except from Sumba island that has similar features to Timor island, and this constitutes a possibly significant bias when performing direct comparison.



Map 4 Geological features (Monk, Fretes, and Reksodiharjo-Lilley 1997).

East Timor is dominated by the Ramelau mountain range, with generally steep slopes reaching the coast north of the range and flatter lands with perennial streams towards the coast in the south. Limestone is dominating in the geology of all of Timor, with soils also derived from other sedimentary deposits throughout the province.

Somewhere between 4 500 and 6 000 km² is suggested as figures for total land area suitable for agriculture in East Timor (see Table 1 above). I.e. less than half of total area, 14 609 km² including the mountainous but agriculturally relatively developed enclave of Acussi-Ambeno (Ambeno district enclave in West Timor). The exact figures for these matters are nevertheless not easily found. Figures for actual land use from official sources differs in some respect substantially. For example the figures found in Timor Timur 20 Years for land suitable for agricultural purposes are confused and not readily accessible. This problem stems from some occurrence of "double counting" as for wet rice and paddy field fishing area. Also there are some discrepancies from source to source, such as for cultivated areas of specific crops in Timor Timur 20 Years obtained from Kanwil PBN Timor Timur 1994 and Kanwil Pertanian Timor Timur respectively.

The potential agriculturally useful area is divided almost half-and-half between lowland coastal areas and flat to undulating highlands and river-valleys. In this respect the usefulness differs regarding to these qualities. East Timor is only moderately diverse in many aspects when it comes to agricultural development, practices and to a certain extent also resources.

Land degradation is according to scarce literature already a pronounced problem. The causes for this probably extend back in history to exploitation of the forests of East Timor under colonial powers. To what extent it is a problem when concerning the development of the districts agricultural sector, if it is merely a problem with existing practises or visa versa is a question that has to be seriously incorporated into any development research. Documented predispose to soil degradation and erosion does however exist. Shallow, easily erodible topsoils covering calcareous sediments is the general picture of most of East Nusa Tenggara. In an undulating environment such as you find it in East Timor erodibility then becomes also a matter of management, i.e. growing the right crops on the right angled land or allocation of land to grazing or reforestation. A typology of degraded land in East Timor is found in Ecology of Nusa Tenggara and Maluku (table 9.11 in page 636) describing critically degraded land to totalling 132300 hectares in the early 1990ies (Monk, Fretes, and Reksodiharjo-Lilley 1997). This actually implies that more than 9 percent of total lands in East Timor is critically degraded⁷.

Critically degraded land (ha)			
Within forest areas	Outside forest areas	Total	Percent of total land
72 200	60 100	132300	9,05

Table 2 Critically degraded land in East Timor. Source: The Ecology of Nusa Tenggara and Maluku 1997.

According to The Ecology of Nusa Tenggara and Maluku (page 601) the extensive secondary vegetation and grasslands are on East Timor a result of widespread deforestation for hunting, cultivation and livestock grazing. In “Man and Environment in East Timor” it is stated that as much as 90 percent of the vegetation of the area has been modified by man at some point in the history. “In conjunction with the monsoon climate which inhibits the fast regrowth of once-felled trees, a rapid degradation from forest cover to open grasslands and in places even to badlands (without any vegetation cover) seems to have taken place in the area” (Metzner 1977). Also due to the climatic conditions in East Timor the possibilities for sustainable forestry practices has to be explored, i.e. the establishment of continuous production forest, industrial forest etc.

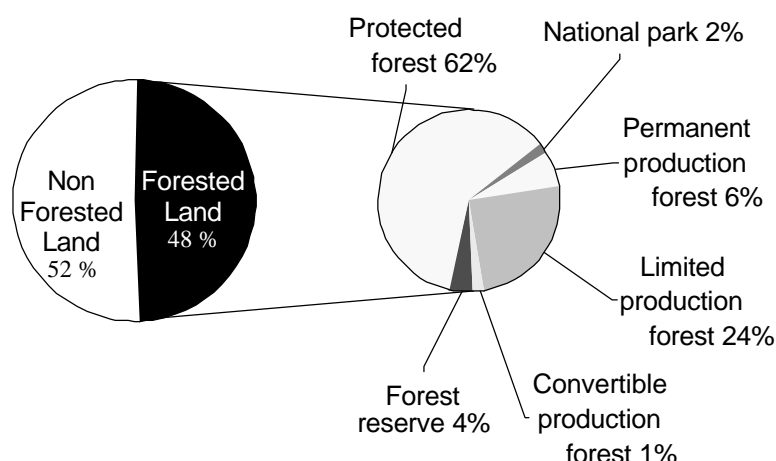
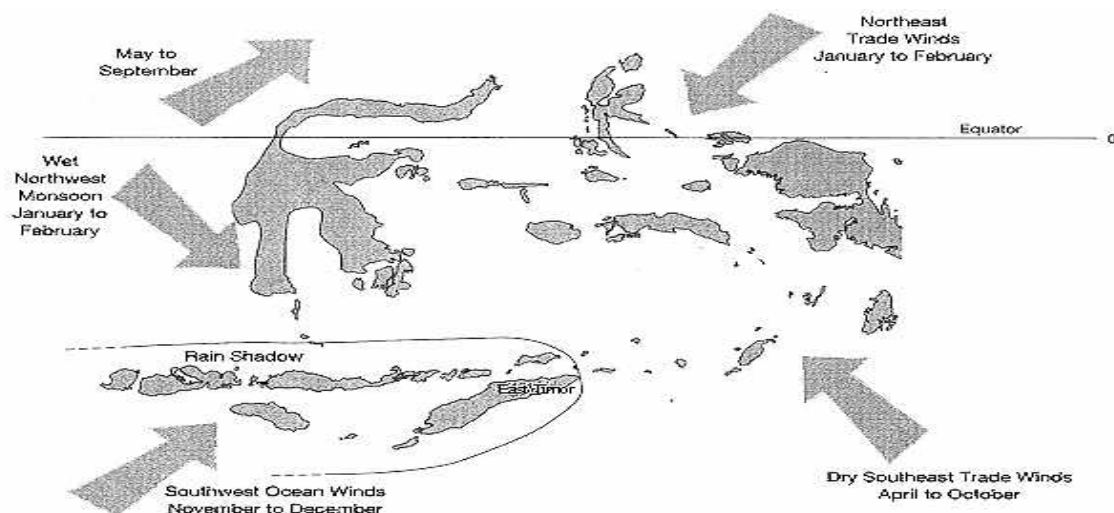


Figure 6 Fraction of forested and non-forested land in East Timor, with utilisation of forested land. Source: Timor Timur 20 Years of Development (Provincial Government of East Timor)

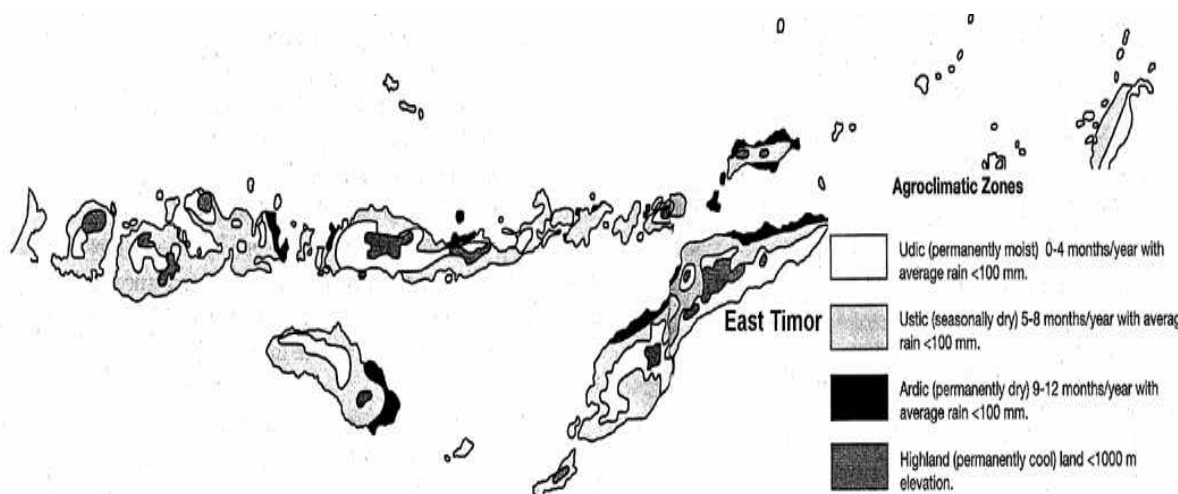
⁷ The figure in The Ecology of Nusa Tenggara and Maluku in table 9.11 page 636 differs from the one given here because the figures there does not add up. The two complete categories ‘within’ and ‘outside’ forest areas does not with an exception for Maluku add up in the ‘total’ column.

The climate in Nusa Tenggara and East Timor, accounted to be the most important determinant for soil development, is described as exceptionally dry throughout. Monsoons and trade winds with accompanying rainy and dry seasons heavily affect the area. Timor is located in a rain shadow implying a relatively dry wet season with significant between-year and local variation.



Map 5 Pattern of monsoon wind and trade winds in eastern part of Nusa Tenggara (Monk, Fretes, and Reksodiharjo-Lilley 1997).

Wet season is December through February and usually West Timor is wetter than East Timor. The south coast of East Timor is agroclimatically classified as permanently moist with enclaves liable to flooding especially in Viqueque and Manufahi. The north coast varies between classifications as seasonally dry in the west and permanently dry in the east. East Timor also experience the greatest extremes in temperature, mean monthly minimum and maximum temperatures respectively varying from 13.4°C to 35°C at different levels of elevation (Monk, Fretes, and Reksodiharjo-Lilley 1997).



Map 6 Ratios of wet to dry months (Monk, Fretes, and Reksodiharjo-Lilley 1997).

Due to the dry conditions lakes and rivers play a comparably important role on the Lesser Sunda Islands, particularly so in East Timor, and will presumably play a crucial role for development of the agricultural sector. However, many rivers are short and steep, drawing

water from narrow catchments resulting in only seasonal flowing. Irrigation schemes based on these water sources has been developed over the last decades, widely spread but not really extensive in the coastal areas of both the north and the south. Limited water resources throughout the island prohibit the expansion of these practises without massive investments in dams and so on.

The lower terraces of the northern coastal zone have nevertheless been subject to wet-rice cultivation development. More than 75 percent of the wet rice production take place in northern coastal regions of Baucau, Manatuto and Bobonaro together with the south coastal area of Viqueque. Of course this has also to do with the development of East Timor as an Indonesian province and infrastructure on the island. The southern lowland areas do have potential in this direction that is not yet utilised.

The upper terraces are used for rain-fed crop production as the highlands and highland-plateau areas make for a more evenly spread distribution of shifting cultivation. Maize, a less sensitive crop to droughts, is commonly grown in such mixed systems. Being the main staple crop historically since the introduction by the Europeans in the seventeenth century maize is grown throughout East Timor. The production though has not been able to regain its pre Indonesian integration level. Rather it has declined since 1975 and small holders mixed gardens are the only system left as extensive gardens has been disappearing due to security and resettlement measures initiated by the Indonesian government.

4.2. Agricultural systems

The great majority of the present agriculture is small scale and based on traditional systems. All traditional systems are described not only by agricultural and economic features (social factors), but also in terms of the biology constraints faced by the farmers. East Timor has living traditions for a number of agro-ecosystems, implying different components such as:

- Shifting agriculture
- Permanent agriculture
- Permanent upland dry fields
- Irrigated fields
- Home gardens
- Tree crop gardens
- Plantations
- Animal husbandry
- Fishing, hunting and gathering

Commonly several of these components are in combination the foundation for the smallholder's livelihood. Income and consumption smoothing is ascertained through pursuing different activities at different seasons, and different environmental and cultural conditions leads to many combinations of the above components.

Three dominant categories of agro-ecosystems are commonly found in East Timor, from the most traditional to the more permanent or advanced system:

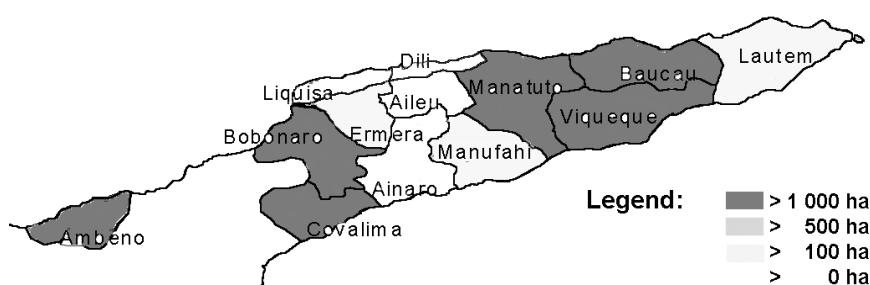
- Fishing, hunting and gathering, in combination with mixed tree gardens and some livestock.
- Shifting cultivation or permanent field for rice/corn production with a mixture of perennial crops, and small-scale livestock all in combination with more or less sporadic fishing, hunting and gathering.
- Permanent dryland for rice/corn or irrigated land rice production in combinations with livestock (also for tilling of land) and homegardens.

Of course there is a continuum of states and practices in between the above stereotypes, not the least considering farmers taking part in activities outside the agricultural sector in a developing economy more exposed to monetary practices.

The smallholder farm traditional system was living at higher elevation, out of range of malaria area and growing crops at a lower elevation. Each household typically utilise only a small piece of land, either permanent or shifting, in the sizes of ¼ hectare and up to one hectare whether or not it is shifting cultivation or permanent field cultivation. Later development has changed these patterns to a not well documented degree by the relocating of people into designated areas for experimental villages and security founded limitations to former land use patterns. The livelihood for these farming households are mainly determined by climatic variations and conditions and also to a large degree market and marketing conditions for secondary crops. The system of growing staple crops of rice and/or corn and the growing of secondary crops also for generation of needed cash as well as for household consumption and bartering is vulnerable to many circumstances. If crops fail in one end of this composite system another practise has to compensate for this in the other end. So also if prices on a secondary crop mainly aimed at marketing decreases, dependency on self-sufficient production on subsistence products are of critical importance.

4.3. Food crops

By 1997 rice is counting for more than half the maize production in tonnes and one third of the area of maize production. Irrigated rice production is gaining importance, but shifting cultivation of dry land rice and maize is still prevalent.



Map 7 Wet rice cultivation area, 1997. Source: Timor Timur Dalam Angka 1997.

Prominent districts for the cultivation of irrigated rice (wet rice) are Viqueque, Baucau and Bobonaro, each producing more than 10 000 ton of rice yearly in 1997. The district producing

the smallest amount of irrigated rice, except Dili, is Liquisa with a yearly production of 466 ton. Rice production is, as are some other food crops, in the statistical publications divided into three categories of intensification: special- (Insus), general- (Inmum) and non-intensification. Almost 60 % of all intensified rice production took place in the three areas mentioned above. The only two districts where there was no special intensification are Manatuto and Liquisa.

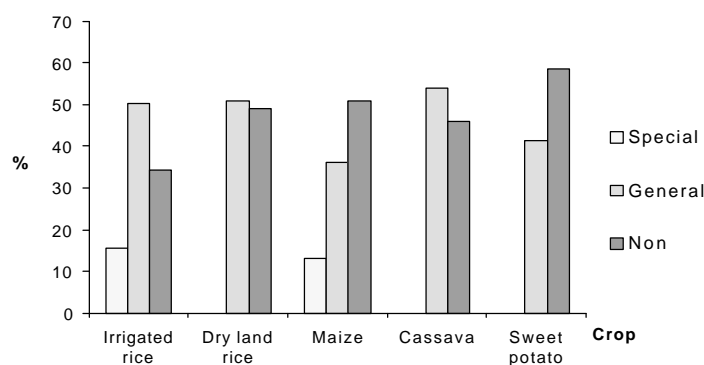
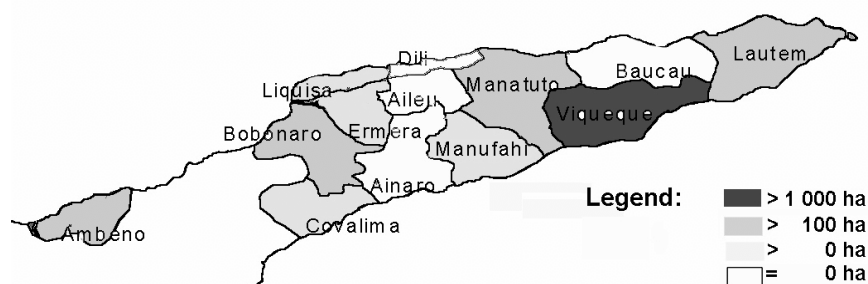


Figure 7 Percent from total crop specific area under different levels of intensification. Source: Timor Timur Dalam Anka 1997.

Dry land rice (non-irrigated) has not been subject to special intensification. More than half of registered non-irrigated rice production is under general intensification, while on the other hand these figures are not particularly reliable. Area for shifting cultivation of rice paddy is hardly likely to be subject to exact measurements. Most of this production is for household consumption and is taking place in remote areas of East Timor. Several districts are registered to not have any non-irrigated rice production: in 1997 they were Ainaro, Baucau, Dili and Ailau.

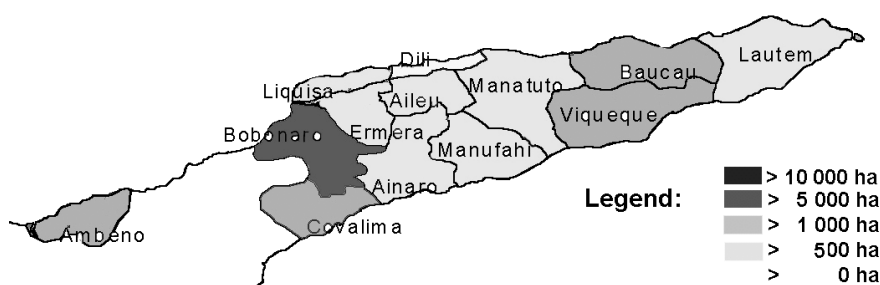


Map 8 Non-irrigated rice cultivation area, 1997. Source: Timor Timur Dalam Anka 1997.

The difference in productivity for both irrigated and non-irrigated rice between the categories of intensification is remarkable though. Total returns are almost twice as high for the high intensity as it is for the non-intensified areas. For irrigated rice the special intensification land returns are 4.77 ton per hectare, while general intensification land gives 3.85 ton/ha and non-intensified land gives 2.69 ton/ha. For non-irrigated rice the difference between general intensification and non-intensification is less pronounced. Respectively these two schemes yields 1.69 ton/ha and 1.5 ton/ha, i.e. both less than half of general intensification irrigated rice.

Maize (corn) is produced throughout East Timor with Bobonaro as the largest producer. In 1997 Bobonaro produced 28 571 ton of maize, i.e. 22,6 percent of total East Timor production

(126 321 ton). Only Dili had less than 1 000 ha devoted to maize fields, and the average for all districts was close to 5 000 ha in 1997.



Map 9 Maize cultivation area, 1997. Source: Timor Timur Dalam Anka 1997.

Most maize is non-intensified production but here the differences in yields from non-intensified to special intensification are not as outspoken as for rice. Still there are gains when intensifying, and the gains seem to be slightly higher for the more productive districts (see table on maize production in technical appendix).

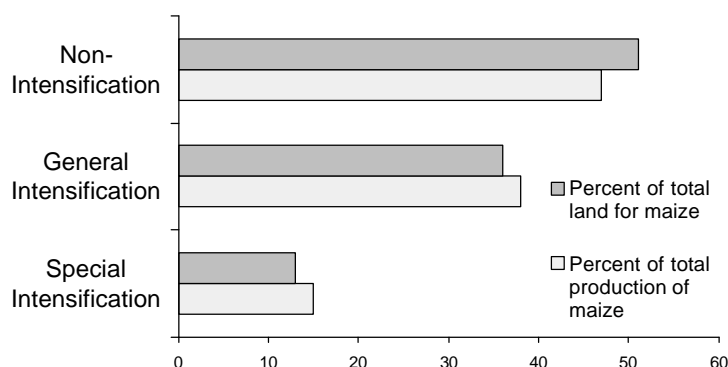


Figure 8 Returns to intensification for maize production. Source: Timor Timur Dalam Anka 1997.

Cassava, sweet potato and different kinds of vegetables are also produced throughout East Timor. Cassava production actually occupied more land on East Timor than irrigated rice production in 1997. Sweet potato only occupied one fourth as much land and vegetables less than half (cassava: 20 515 ha, sweet potato: 4 271 ha and vegetables: 8 418 ha). The production of vegetables, such as onion, garlic, red pepper, potato, cabbage, beans, cucumber, carrot, kidney bean, tomato, eggplant, squash and spinach, is unevenly spread out over East Timor. Land allocated to this production varies from only 39 hectares totally in Liquisa to 4 277 hectares in Bobonaro. There are also great differences as regarding returns per hectare, even for the same crops.

	Cassava			Sweet potato			Vegetables		
	Ha	Ton	Ton/Ha	Ha	Ton	Ton/Ha	Ha	Ton	Ton/Ha
Covalima	1323	5600	4,2	122	508	4,2	189	674	3,6
Ainaro	257	910	3,5	530	2143	4,0	1243	1712	1,4
Manufahi	1918	7606	4,0	330	1266	3,8	1083	5751	5,3
Viqueque	2933	11760	4,0	473	2000	4,2	172	659	3,8
Lautem	1250	5590	4,5	288	1213	4,2	81	280	3,5
Baucau	1017	4576	4,5	333	1272	3,8	163	692	4,2
Manatuto	677	2869	4,2	167	784	4,7	49	210	4,3
Dili	701	2724	3,9	123	519	4,2	103	479	4,7

Aileu	1533	6441	4,2	287	1013	3,5	578	2329	4,0
Liquica	1240	5273	4,3	134	548	4,1	39	143	3,7
Ermera	570	2423	4,3	296	1272	4,3	340	1140	3,4
Bobonaro	6097	25445	4,2	894	3984	4,5	4277	4069	1,0
Ambeno	999	4070	4,1	294	1126	3,8	101	315	3,1
Total	20515	85287	4,2	4271	17648	4,1	8418	18453	2,2

Table 3 Production figures for cassava, sweet potato and vegetables in 1997. Source: Timor Timur Dalam Anka 1997.

4.4. Animal husbandry

Animal husbandry is a long-standing tradition for cattle, buffaloes, pigs and horses on East Timor. The potential for East Timor cattle production is generally held to be of some significance. Not only because of current and potential designated lands to grazing, but also because of traditions and established practises in this direction. Security concerns, land rights questions, and lack of capital for investment in this sector may all have held back expansion. Appropriate land for grazing of agricultural animals totals more than 200 000 hectares, or about 30% of all agricultural lands, but at present only about one third is being used (Brahmana 1996)⁸. The population of livestock took a sharp drop after the integration with Indonesia, but has as before mentioned regained importance gradually. Livestock varied wildly over the years of Indonesian governance, but livestock and meat production has regained vitality of some sort and there was an expansion in the meat produced from most agricultural animals up until 1996-97 (Badan Pusat Statistik Propinsi Timor Timur 1998b). Lately cow, buffalo, pig, goat/sheep, duck, chicken and pedigree hen are among those domesticated animals of importance.

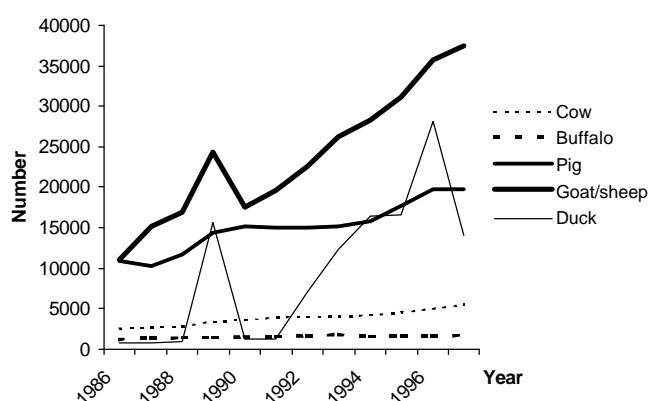


Figure 9 Number of slaughtered live stock by year 1986 – 1997. Source: Timor Timur Dalam Anka 1997.

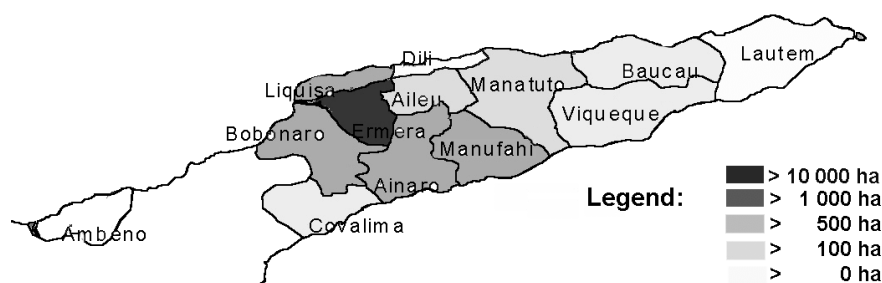
4.5. Plantations

Smallholder plantations have been established, in some cases merely revitalised, with accompanying seedling centres in selected regions, but information on the functioning of these plantations is scarce. Even though, it is clear from official statistics that estate crop-production is the fastest growing sector of agriculture. Growth stems mainly from expansion in planted area of coffee, coconut and cocoa. Plantation crops have been subject to schemes

⁸ The figures for these matters differs greatly from source to source, e.g. figures as above compared to figures from Central Bureau of Statistics.

designated to rehabilitation, replanting and fertilising with quite ambitious targets. For example cocoa production was targeted to increase from 41 tonnes annually in 1991 to 5 000 tonnes in five years (Regional Investment Coordinating Board of East Timor 1993). The realisation of these targets has nevertheless proven to be difficult, most products having problems to even reach levels experienced before 1975, despite some growth in area designated to estates. For example the area of cocoa plantations was in 1991 some 316 ha producing 41 ton, and in 1997 it had expanded to 509 ha producing only 27 ton. On the other hand there has also been products that's importance has seized during Indonesian ruling. Rubber was during the Portuguese period the third largest export subject from East Timor, but has since 1976 almost disappeared as an agricultural crop (Saldanha 1994).

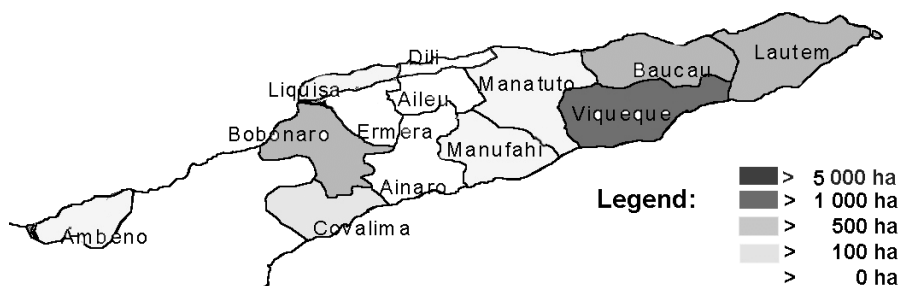
Plantation crops suffered greatly from the integration with Indonesia. Traditionally the yields from such activities had been of overall great importance for the local livelihood. Both as cash revenue generators and for local consumption, these crops had in many ways played the role as a significant part of the foundation for the composite systems of agriculture. Over the whole time span (1976 to 1994) development efforts in this direction was carried out, although at a minuscule level and severely hampered by security issues that weighed heavier than seriously revitalising this important sector. In addition to the comparably eradicated coffee production, most crops had fallen away and struggled to recuperate. Development efforts were directed to the traditional crops of coffee and coconut. These crops had traditionally been produced in large quantities in East Timor, contributing greatly to the local economy by being subject to export event to foreign countries. Other crops where also attempted introduced, such as clove, cashew nuts, cocoa, pepper and vanilla. While small-scale estate crop production is still prevalent in East Timor, large-scale estates exist for coffee and questionably also vanilla and cacao.



Map 10 Coffee production area, 1997. Source: Timor Timur Dalam Anka 1997.

A notable estate crop product that has been able to regain its position is coffee. Coffee has shown rapid growth in terms of volume in recent years, almost doubling its output from 1998 to 1999 (Murphy 1999). Coffee production has seen shifting regulations and has been under the control of different actors since 1991. Currently, farmers organised by the US based National Cooperative Business Association (NCBA) control the production and marketing of coffee. Since this arrangement was duly signed and the producers formed a processing and sales cooperative with the NCBA four years ago, production has increased year by year. Still small-scale (small holder) estate production dominates that of large-scale estates. For coffee there were in 1997 more than 45 000 farmers involved in production. On average these farmers produced 215 kilos that year. Compared to smallholders in for example East Kalimantan this is actually a quite significant harvest, and possibly contributes substantially to the household economy and undoubtedly contributes substantially to the province's economy. Main districts for the development of the coffee plantations where Ermera, Liquisa, Manufahi

and Ainaro, all districts close to the administrative district of Dili. The pattern of these efforts is easily visible in today's production volumes for the different districts, with Ermera as the largest producer (27 821 ton in 1997 in Ermera and 6 012 ton in Manufahi as the second largest producer).



Map 11 Coconut production area, 1997. Source: Timor Timur Dalam Angka 1997.

The main producers of coconut, hybrid and “normal” species are found in Viqueque, Lautem and Baucau with only minor production in other districts. The hybrid coconut has nevertheless shown to be of only minor importance with five districts containing productive trees, producing all in all 19 ton yearly in 1997. The traces of the efforts in the other plantation activities are found in today's production volumes (1997 that is), and are proven to mostly be of minor importance. For example the cocoa production in 1997 equalled only 27 ton in total, with the district of Bobonaro producing 22 of these tons.

Clove was produced in Ermera and Bobonaro, totalling 2 ton, with plantations established also in the districts of Manufahi, Baucau, and Aileu. Vanilla is found in Liquisa and Ermera, producing 4 ton all in all a year. More significant estate production we nevertheless find for areca nut and candle nut with main production centres in respective districts Viqueque and Covalima, although production is not essential to national figures for Indonesia or even East Timor⁹.

A last contribution to plantation crops is *kapok* (*Ceiba pentandra*, for extraction of (fibre and) oil, used for food and soap) with active producers in eight districts, and most prominently so in Bobonaro and Ambeno.

	Areca palm		Candlenut		Kapok		Cocoa	
	Ha	Ton	Ha	Ton	Ha	Ton	Ha	Ton
Covalima	229	20	1502	389	0	0	0	0
Ainaro	192	28	279	104	25	3	0	0
Manufahi	468	49	210	86	24	4	1	0
Viqueque	4336	342	188	52	27	3	434	0
Lautem	53	9	104	42	13	3	4	2
Baucau	61	4	963	185	8	0	9	3
Manatuto	694	8	162	44	8	1	5	0

⁹ The betel or areca nut comes from this palm (*Areca Catechu*), a slender climbing tree that grows to 75 feet in height. The nut is used for chewing with ground and burnt lime and the sirih leaf of the piper betle palm (*piperaceae*), and is actually more popular worldwide than alcohol or tobacco. The nut and other parts of the palm also have medicinal uses, such as for traditional treatment (of cholera, dysentery, fatigue, fever, hysteria, malaria, tapeworm and much more), and a place in traditional ceremonies. Kemiri (*Aleurites moluccana*), or candle nut, is a versatile tree and the fruit has many uses. It's used for spices in cooking and the extracted oil has its most famous use in Indonesia for hair- treatment and beauty. It is also used for oil for candles, lamps and soap.

Dili	52	5	6	2	1	0	1	0
Aileu	4	1	167	18	0	0	0	0
Liquica	5	0	25	5	0	0	0	0
Ermera	6	2	7	1	6	2	5	0
Bobonaro	153	15	653	99	74	18	50	22
Ambeno	597	34	62	28	76	14	0	0
Total	6850	517	4328	1055	262	48	509	27

Table 4 Other estate crops production 1997. Source: Timor Timur Dalam Angka 1997.

Reasons for the low productivity in the sector of plantations have been stated as unavailability of extension workers, lack of people willing to labour for plantations, and finally lack of capital to initiate estates of adequate proportions for economic viability. Most of these cash crops are labour intensive in production by nature when first established. If the problems stated above is true wrt labour demands and supply, this has to be researched thoroughly. In many instances increased production in the estate sector is pointed out as a major road to increased employment and improvement in national income (Anonymous to Timor Link 1998). Evidence for improvements in local livelihood is though harder to find. Investments in the plantation industry other places in Indonesia is marked by exploitation of cheap labour and forceful expropriation of land with subsequent land conflicts, and not by the just distribution of benefits. There are also serious environmental concerns to take into account (see recent debate on plantations and people by for example Eric Wakker in Inside Indonesia/April – June 1999, and also The World Rainforest Movements Plantations Campaign publications in the Briefing Paper series on environmental aspects).

The aspect of lack of capital has been attempted solved by performing projects directly aiming at the different products. There are prominent examples for candlenut cultivation, banana gardens, cashew nuts and of cocoa plantations. The same kind of projects has been carried out also for horticultural crops such as soybean and peanut, and even for the former staple crop of corn. The main promoter of such project is The Regional Investment Coordinating Board of East Timor, which produced a number of leaflets for inviting financial contributions to these projects in 1993 (see for example Candlenut Cultivation Project Profile, 1993). These projects were aimed at also foreign investment, which has proven to be a complete failure. See for example the web page for the regional investment statistics by the central Investment Coordination Board for the Republic of Indonesia (<http://202.158.4.117>) where it is obvious that no foreign investments has been negotiated through this forum to East Timor and only low domestic investments are accounted for, for the years of 1967 to 1998.

Curiously enough there was initiated major investments also in another non-traditional crop in East Timor in 1996, namely sugarcane. Large investments in a major sugar mill in Manufahi was planned and approved in corporation with the Indonesian Investment Board for a private Indonesian company. The plantation in itself was planned to extend over 25 000 ha in Manufahi and into Viqueque and to produce 162 tons of sugar and 8 ton of molasses every year (Anonymous to Timor Link 1998). It is not clear if the preparatory works has been launched or if it has all been solely in planning up to now.

This leads to the final question, which answer is neither to be found from literature, on infrastructural demands for the realisation of these plantations. In the project descriptions from the Regional Investment Coordinating Board of East Timor it is for all different crops a paragraph on the investment requirements. These include everything from acquiring land to all capital investments. It is to be suspected that very little infrastructure except for the road skeleton from the phase of stabilisation exist that can be taken advantage of in the revitalising

of the East Timor economy by expansion of the plantation sector. At least when it comes to introducing new crops and expansion into districts untouched by the scarce development so far.

Commercial forest plantations are also a reality in East Timor. Run by the government backed HTI scheme (Hutan Tanaman Industri) to provide supplies of raw materials for wood processing industries. Intentions for this program was reducing and eventually halting the need to cut naturally matured forests. Localisations were supposed to be in production forest or conversion forest, and the HTI did possess licences for clear cutting of designated areas. In other Indonesian provinces HTI is also associated with transmigration (HTI-trans) which implies transmigration of labour to the concession areas. HTI operated 30 000 ha in East Timor from which 250 ha were planted in 1989-90 and furthermore 500 ha in 1990-91. The 30 000 ha referred to are licensed area, and not area that has been planted or even prepared for planting. There has been five species of trees planted in East Timor by the HTI, from which four are not indigenous to East Timor (Monk, Fretes, and Reksodiharjo-Lilley 1997).

From official statistics it is clear that estate crops contributed about one third of food crops to regional GDP in 1997. The sectors share to GRDP has been in the region of four to almost six percent in constant prices over the years 1993 – 1997, and its product value has grown since 1995 in constant prices.

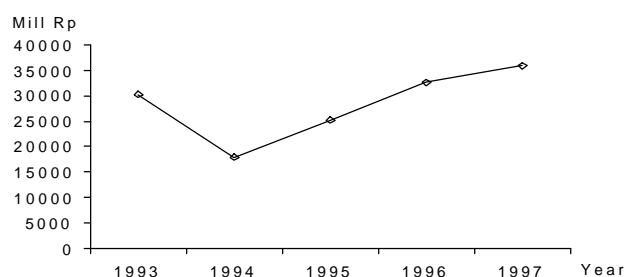


Figure 10 Farm non-food and estate products at constant prices 1993 – 1997. Source: Timor Timur Dalam Angka 1997.

4.6. Forestry

Large parts of East Timor is classified in a Department of Forestry land cover map to be consisting of dry, not productive land (Ministry of Forestry and Estate Crops Organisation web page: <http://www2.bonnet.co.id/dephut/peta.htm>). Due to the climatic conditions in East Timor the possibilities for sustainable forestry practices have to be explored, i.e. the establishment of continuous production forests, industrial forests etc. A low rate of forest cover and low activity in the sector of forestry sees to that forestry practises in East Timor is scarcely documented. According to Timor Timur Dalam Angka 1997 (BPS), and confirmed by figures from the Department of Forestry web page, there is only a minor production of saw wood, circular wood and firewood for commercial purposes. No other uses are documented, except from fragrant woods. Still fragrant woods stand for a larger part of all documented forest production, with sandalwood (*Santalum album*) as the prominent source for a variety of produces. Scarce resources by and large restrict the potential for forestry and related activities. Production forest accounts for only 31 percent of existing forests, with 24 percent of this categorised as “limited production forest”. During the Portuguese colonial era the main deforestation took place in the search for export lumber of high value tree species such as for example ironwood. The deforestation in this period (from the early 16th century to 1974) is

believed to be of significance throughout East Timor. East Timor's strategic position in the Pacific War (1942) and the utilisation of East Timor as a battlefield is also believed to have had some impact. The Indonesian logging activities were also of a significant order, and was an ongoing process in the production forest concession areas as well as in areas designated for conversion. The official figures for these practises are available and it should be possible to investigate these for elements of sound or not management, or at least to trace actual volumes over the last twenty and more years.

4.7. Non Timber Forest Products (NTFPs)

In accordance with general results derived from increased research on agroforestry it is also advised to make investigations into non-timber forest products (NTFP) and other activities to sustainably utilise the remaining forest without logging. NTFPs have traditionally had a prominent place in the composite systems of traditional agriculture throughout East Nusa Tenggara. For example in East Timor sandalwood has traditionally had a place in small scale agriculture, regulated by *adat* law, and has under former regimes proven to supply a sustainable and valuable contribution to local livelihood. Nevertheless, current practices and forced situations have proven to be devastating for this tradition and the resource itself (Badcock 1991). Compared to the other provinces in Nusa Tenggara the registered NTFPs actively harvested for commercial purposes in East Timor are few. Only four NTFPs, betel pepper, lesser galangal (ginger), beeswax and honey, are noted in The Ecology of Nusa Tenggara and Maluku (1997: 644) as true NTFPs commercially harvested. Still in the Timor Timur Dalam Angka (1997: 153) fragrant woods and bamboo are also listed as forest products production over the later years. Other possibilities include rattan, cinnamon and possibly also trees for extraction of resins such as kopal (Ind. Damar) and benzoin (Ind. Kemanyan). The possibilities for increased utilisation, in terms of traditions, resource base and marketing opportunities needs further research.

4.8. Fishery

The marine resources of East Timor are on the other hand associated with higher potentials, even though current exploitation is at a reasonably low level. The main fishing region in East Timor is Dili, where more than fifty percent of the total fishery employees reside and who owns the larger fraction of the motorised vessels with the most effective fishing gear. From an estimated potential for total East Timor maritime production of more than 600 000 ton/year only about one percent of this is annually harvested (Brahmana 1996). The number of fishermen as well as production and productivity has shown growth over the last decade, but only at a very modest level.

In 1987 5581 sea fishermen managed to harvest 580 ton of fish, a yield of only slightly more than 100 kg per fisherman. These fishermen span from being full time fishermen to minor part time participants. The numbers grew to 9066 fishermen catching 2423 ton in 1997, i.e. from one tenth of a percent of the potential to one quarter of a percent. Considering natural fluctuations (in 1992 only 135 ton was caught) and potential the harvest has to be considered showing only moderate growth for the latest decade of development (Badan Pusat Statistik Propinsi Timor Timur 1998b). Except from that it is also here probably severe under reporting, poor equipment's, low skills and lack of capital in the sector are all reasons for the low production.

Some Indonesian initiatives have been experienced over this same time span. Fish markets have been established, and special attention has been paid to fresh water fisheries. This includes the initiation of a fish hatchery, the instalments of fishponds and supply of fry from suitable species.

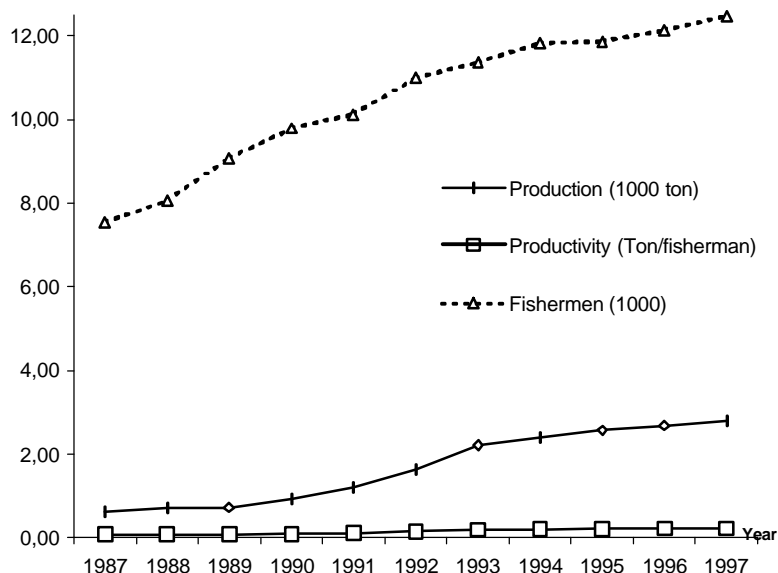


Figure 11 Development within the fishery sector 1987 – 1997. Source: Timor Timur Dalam Angka 1997.

Still in the sea fisheries less than half of the labour forces are full time fishermen. The rest are doing part time fishing and possibly just occasional fishing. The fleet of fishing vessels is in this respect also rather backward. The majority of boats employed for the purpose are simply dugout canoes, accounting for 995 boats in 1997 from a fleet of otherwise 402 small boats and 630 boats with outboard motor. No larger inboard motorboats were registered in East Timor in 1997 (Badan Pusat Statistik Propinsi Timor Timur 1998b). There seems to be potential scope for increasing the catch within limits of sustainable yields. The main challenge is both to improve capacity for the fishing fleet, and the marketing channels. Guidance should be researched and provided in order to promote the strategic development of the fisheries sector.

4.9. Capital and mechanisation

The prevailing system of shifting cultivation on East Timor does not require much in the direction of agricultural mechanisation. Normally the system only involves clearing and burning natural vegetation prior to a one or two season utilisation of the land. Still there are different levels for traditional land uses. In the lowland areas where there is better access to water and irrigation there is found ecologically sustainable practices for growing rice, utilising buffaloes for tilling the soils. These traditional systems are generally considered ecologically stable as long as land pressure is low; i.e. there is an abundance of land.

There is little existing mechanisation of East Timor agriculture as by now. As before mentioned the introduction of agricultural machinery has not been entirely successful. A variety of tractors have been introduced to the farmers, some more successful than others. The larger tractors have by and large proven to be a failure, mainly because of lack of spare parts and also as a result of mal-use due to the fact that most users were illiterates. It is also a fact that smaller tractors, the “hand tractors”, are a comparable success. From 276 hand tractors in

1997 only 11 were reported broken, as opposed to the big tractors where 20 from 51 were already useless (Viegas 1999). The survival of the hand held tractors has probably to do with the same aspects that ensured the failure of the bigger tractors. The easy handling and small size of the tractors (accessible spare parts and resemblance to other motorised tools such as mopeds) can be reasons for their relative better durability.

There are obvious advantages with tractors compared to using buffaloes for tilling land, such as being able to work long hours during peak seasons, better weed control and other appliances such as husking of rice¹⁰. From the farmers point of view it can be assumed that tractors are economically attractive, but one has to be aware that these might be substitutes for labour and animals only, and do not per se guaranty increases in cropping intensity and yields. In this respect it is favourable to follow the advice of Viegas (1999: 10) to take into consideration the complexity of farming in East Timor. I.e. taking into account the biophysical and socio-economic environment under which every farmer is constrained.

Documented use of chemicals for food crops limit itself to some minor use of pesticides and fertilisers. For pesticides there is established local knowledge on insecticides that is used solely for wet rice cultivation. Other unidentified pesticides are also used for wet rice cultivation. Chemical fertilisers are also limited to wet rice cultivation. Neither hill rice nor maize cultivation implies any documented use of fertilisers, except for manure in the maize production. Manure is not documented used for wet rice production, which is strictly opposed to the traditional fashion. The chemical fertilisers used are urea and phosphatic additions (TSP and DAP)¹¹ and some other unidentified substances, but the extension of use varies greatly from area to area as is seen from the table below. In the western and middle districts of East Timor the use of fertilisers are far more extensive. In the eastern outskirts only urea is utilised, while in the middle districts two or all of the three categories are used (urea, TSP/DAP and others). Compared to other more developed areas in Indonesia, such as Java, the input of fertiliser is still low in East Timor.

	Total (kg/ha)	East Development Area (kg/ha)	Middle Development Area (kg/ha)	West Development Area (kg/ha)
Urea	42,33	50,48	37,33	39,19
TSP/DAP	26,44		37,33	42,00
Others	10,67		32,01	

Figure 12 Fertiliser use per development area in 1996. Source: Cost Structure of Paddy and Secondary Food crops in East Timor 1996, BPS East Timor Province.

Still the greater part of costs in the production of wet land rice is associated with other input in production than fertilisers and pesticides. The largest posts for costs associated with the production of paddy rice, maize, cassava and sweet potato are rent for agricultural implements, rent of animals, transportation and the renting of labour for the different tasks in cultivation. Also with respect to costs per hectare cultivation the figure for East Timor is lower than more advanced areas. So is also production per hectare.

¹⁰ The use of buffaloes in wet rice cultivation used to be a distinct system in some regions of East Timor. Subsequent to rice harvest the field was used to grow grass on dry land. The grassland was in turn used for grazing and/or as fodder for cattle in livestock rising. The abolition of cattle and buffalo in the years of 1975 to 1980 nevertheless put a halt to this practice as well as leaving many rice fields idle (Aditjondro 1994).

¹¹ Triple superphosphate (TSP) and diammonium phosphate (DAP).

	Indonesia		East Timor	
	Value (Rp)	% Cost of production	Value (Rp)	% Cost of production
Production	2239830	100	1560592	100
Total Cost	759235	33,9	568732	36,44
Seed	32551	1,45	23485	1,5
Fertiliser	151287	6,76	25489	1,63
Pesticide	24354	1,09	4117	0,26
Transportation	19596	0,87	50258	3,22

Figure 13 Production and Cost of Production per Hectare of All Paddy in Java and Wet Land Paddy in East Timor, 1996. Sources: BPS (Statistics Indonesia) and Cost Structure of Paddy and Secondary Food crops in East Timor 1996, BPS East Timor Province.

4.10. Land rights and ownership

Land ownership matters have seen major influences from colonising powers through the last three centuries, from being controlled by local traditional kings, through an era of Portuguese influence with the Catholic Church as a major player, up to today's Indonesian regulations. According to current legislation lands are divided into communal and state lands. Communal lands are largely subject to personal/communal/village ownership and management and are based on traditional right systems (*adat* or traditional land). Communal lands also have other designations in East Timor, such as for communal plantations and transmigration areas (controlled statutory). State lands mainly contains forested regions and other land of "public importance" (Brahmana 1996). The matters has been attempted regulated but only partially implemented by the issuing of official Government Regulation no. 18 in 1991, addressing such themes as traditional rights and existing facilities. The full enforcement of these regulations was postponed due to strong local reactions (Saldanha 1994).

In this respect there are four aspects that are of importance for the demographic pattern and the utilisation of lands for agricultural purposes. Firstly, the forced migration during the war time lopsided the traditional land use and rights patterns that pervaded even after farmers were allowed to return to their respective villages. Secondly, the issue of land rights is a question of potentially great difficulty not the least because of the resettlement schemes for East Timorese farmers into such dedicated villages and areas. Thirdly, the transmigration program further complicated small holder land rights issues, shifting land from local people's possession into the hands of "pioneer farmers" from Java and Bali. And fourthly, the pattern of big landholders did not change and there were forces towards monopolisation of the major crops and resources.

The issue of land rights is a question of potentially great difficulties not the least because of resettlement schemes. Of course also social fragmentation has been a result from this, leading to potentially widespread land disputes and uncertainty about property rights. Farmers fleeing away from their land and forced resettlement have made redistribution of land a sensitive issue that will unavoidably come to the surface. A not insignificant amount of land and people have been subject to reallocations over the last three decades. Model villages have been established beyond traditional grounds, frequently on the steeper north coast. The main problems faced by these farmers were that the guided villages implied resettling with high population density providing farmers without a basis for self-sufficient subsistence. Again this implied increased remoteness to swidden fields, hunting grounds and customary forests, subsidiary more difficulties wrt managing the land traditionally.

The transmigration program has first and foremost taken place in Bobonaro and Covalima, in addition to smaller schemes in Baucau and Viqueque. These transmigration locations were not, as is the case for East Kalimantan and Irian Jaya, located in pristine lands but rather in areas that were already under cultivation by locals. The Indonesian government categorised these lands as under-utilised and Javanese and Balinese farmers were to play the role as “model farmers” teaching better farming to the locals (Aditjondro 1994). Supposedly the number of transmigrants are in the neighbourhood of 25 000 people from Java and Bali since 1982. The relative growth in prosperity in these areas has subsequently also attracted more voluntary spontaneous migration into the areas, adding to land scarcity and pressure in land rights questions.

After integration pro Indonesian landowners were to a large extent able to reinstate their control over larger sized plantations under Indonesian government. The production of the major agricultural cash revenue raising commodities, such as coffee and sandalwood, was soon monopolised during the integration phase. We know by now that for coffee this has changed and that the supply of sandalwood has been reduced drastically. For both coffee and sandalwood the army took a greater share of business involved by the means of PT Batara Indra Group, and several factions under this group. Extended monopolisation took place, even violating already existing laws, and absentee land ownership by large-scale companies became prevalent. These patterns has to a large extent pervaded up until today, as far as is known from literature (see for example Aditjondro 1994, Timor Link 43 Special Supplement and also Saldanha 1994).

Note! Sources for data

Statistical data for East Timor are mainly only possible to derive from official, governmental sources of Indonesian origin. Other sources are scarce and few surveys and actual fieldwork has been undertaken by independent agents. The data supporting views in this report have been drawn from various sources, but it has to be admitted that most data found in literature has its origin from a small core of basis statistical statements from public Indonesian dissemination agencies. Most prominent for agricultural sector data are information that has its origin in the Central Bureau of Statistics and its regional East Timor office, the Central Board of Statistics of East Timor Province (Kanwil Biro Pusat Statistik Timor Timur). Ultimately these data has its origin in material collected by the respective subsectors, local agencies and services. Food crops and horticulture data are collected by both Agricultural Extension Service (Mantri Tani) and Subdistrict Statistical Officer (Mantri Statistik) in all subdistrict (kecamatan). Estate crops data are collected monthly by estate administrators and are send directly to the Central Board of Statistics (CBS). Forest concession estate data are collected bi-annually. Forest concession estate data are collected by performing questionnaires in base camp locations directly. The annual execution of the questionnaires is by the statistical enumerator "Mantri Statistik" or staff members of Regional Statistics Office, and these are send directly to the Central Board of Statistics (CBS). Fishery data is collected quarterly at markets by the auction place manager, and for fishery establishment production data is collected annually. Livestock data is reported quarterly. Since early 1987 livestock has been measured by Daftar RPH, used for recording livestock slaughtering in or out of slaughtering place, and the Keurmaster used for recording livestock slaughtering out of slaughtering place. A large part of these data are nevertheless founded on the reporting from the villages themselves, by the Monografi Desa/Kelurahan (desa is village and Kelurahan is the political district administered by the lurah) that is completed by the head of the village (kepala desa or lurah). In many cases these are uncomplete descriptions of village and

household inventory and economic activities, but still form the sole source of information on such.

Two publications are widely referred to in existing literature on East Timor, namely the annual "East Timor in Figures" (Timor Timur Dalam Angka) and also " GRDP East Timor Province 1993-1997" published last in 1998. Data in the form of tables and figures from these sources is despite its known deficiencies thought to be the only source for macro level information on the agricultural development over the years of Indonesian ruling. In most aspects indeed it is, making for the circumstancive treatment of the general and more specific aspects of the East Timorese economy.

Two aspects are of importance when considering information from quantitative sources on East Timor. Firstly, in a primitive economy, not so much in administrative as at a distributed level where economic activities are carried out, not much is put down on paper to account for these activities. The East Timor economy consists of 80 - 90 % agriculture, and from this a great majority is of a subsistence quality with the covering of household needs as the main productive aim. A large part of the staple food crops never meet a market, and it is not entirely clear to what extent this production is accounted for in public statistics. Even though it is evident that control of local settlements and local activities has been performed throughout East Timor, it is not clear to us to what extent this also includes the monitoring of traditional agricultural activities.

Secondly, the collection and treatment of the data that are collected on physical sizes as well as other in-/outputs are not normally subject to the quality securing measures one could wish for. When carefully reading public statistics on agriculture it is clear that these have significant deficiencies. Frequently there are inconsistencies in tables, wrong calculations, unaccounted for large shifts in quantities from year to year and lastly also simply wrong representations of figures wrt comma and punctuation use etc. It is also in the East Timor case relevant to ask the question to what extent figures has straight out been fabricated at some level in the bureaucracy for some purpose, and if significant sizes in the accounts for the province are systematic over estimating real activities.

5. Conclusive remarks

Agriculture will continue to play a vital role in the transitional economy of East Timor. The influence of agricultural growth on rural incomes and food availability will continue to have substantial impact on rural poverty and strongly affect overall economic growth. A key determinant for the development of the East Timor agricultural sector is an assessment of any measure in a long-term perspective. While on the other hand East Timor does not have time on their hands and the repercussions of the recent drought and the liberation process forces actions to find its foundation on fewer considerations. Policy makers and other involved agencies should acknowledge this.

In a severely lopsided economy and culture as is the case for East Timor, immediate development is a terrain one have to tread carefully. Pending on the results from inquiries into the state of the agricultural sector, it is clear that East Timor has limitations and that one should draw from knowledge gathered elsewhere in the world when assessing immediate remedies and actions. East Timor can in many ways be held to be more similar to Africa then Indonesia: Dry climate, war and social unrest, capital deficits in agriculture, lack of functioning markets, with following low productivity and income. The lack of development

within the agricultural sector of East Timor can be explained by several factors. From nature's side, the island has not as favourable conditions in terms of rainfall and soil quality as other areas of Indonesia. Two and a half decades of wars and civil unrest have had a devastating impact, in terms of lack of market development, input supply and the climate for farmers to undertake long term investments. Agriculture is therefore characterised by limited use of purchased inputs, low productivity and resulting low farm incomes and food security.

Summing up the impressions given by working with the material that supports the writing in this chapter there are three elements that stand out:

- It is difficult to make clear-cut recommendations for agricultural policies, given the lack of basic information and data about the sector. Official Indonesian data are probably biased towards showing a positive development under Indonesia rule, while other sources tend to exaggerate in the other direction. Thus there is a clear need for getting reliable baseline data to be used as the basis for any action oriented programme.
- The issues of land rights and distribution of resources is likely to come to the forefront of the debate. These are very complex issues due to overlapping claims, different tenure systems (official statutory vs. customary), historical rights, lack of or unclear official records for ownership etc.
- It is clear from this review that there is a growth potential in agriculture. Improvements of subsistence agriculture by input provision and extension services, export promotion strategies for certain export crops (cf. the recent success of coffee), and improving the equipment and marketing facilities for fisheries appear to be priority areas in an agricultural development strategy.

Most of the agricultural sector is of a subsistence character. A vast majority is involved in day to day activities related to a variety of crops contributing to the livelihood of the household. There is an urgent need of surveying this. Getting quantitative information on magnitudes, the relative importance of the different activities, preferred activities and possibilities for deriving livelihood from the activities in the by now free East Timor should be a priority. The second point above will inevitably involve processes that will not be readily resolved, implying faltering responses to the new situation, not the least in the agricultural sector. Nevertheless, there are existing physical structures that will form much of the foundation for the development. A high priority should also be to get an overview of these structures, an assessment of the state of these structures and human capital in this respect. This goes for road network, irrigation schemes, estate production schemes as well as capital in fishing and forestry. Thirdly, which relates to the first point as well, the composite system of agriculture found in the traditional activities, which can involve cash crops like coffee should be explored for its economic, ecological and cultural viability. East Timor is a country liable to naturally occurring fluctuations in climatic conditions. At the same time it growing food and cash crops both depending on market fluctuations as well as droughts etc. This is implying that the aspect of composite practises for risk diversification should not be neglected in research into the possibilities of the existing systems.

Table of physical features and main agricultural activities by district in East Timor

Sub-district	Area (km ²)	Population (1995)	Physical features	Main agricultural activities
Covaima	1225	52623	Hilly to mountainous with plains suitable for agriculture towards the coast in the south. Dry in dry season and wet in wet season.	Sandalwood, candle nuts, tobacco, coffee and coconuts. Mainly traditional agriculture with hill rice, corn etc.
Ainaro	798	48995	High mountains to hilly, coastal plains to the south suitable for agriculture. Fertile soils in lowland, wet in wet season and dry in dry season.	Tree crops including ironwood and rubber. Hill rice, corn, peanuts and sweet potatoes.
Manufahi	1324	40773	Mountainous in the north with extensive coastal plains to the south suitable for wet rice cultivation. Perennial rivers.	Traditional agriculture, generally non-irrigated rice, corn, cassava, beans and tubers. Coffee in the north, and different tree crops.
Viqueque	1780	62815	Mountainous and hilly to fertile lowland plains. Two wet seasons a year. Potential for flatland grazing.	Still traditional agriculture, some industrial plantation forests. Main crops are rice, copra, corn, cassava and also buffalo.
Laulem	1702	52298	Mostly low elevation fertile lands but also mountains and hills. Several perennial rivers. Wettest area of East Timor	Traditional agriculture; hill rice, corn, green pea, cassava, coconut. Fishery and livestock.
Baucau	1493	89993	Mostly hilly and dry with some wet flatlands in northern coastal region. Extensive dry season.	Minor traditional wet lands rice cultivation. Mostly hill rice, animal farming and fishery.
Manatuto	1705	36870	Lowlands in north and south, mountainous in central parts. Moderate rainfall throughout.	Traditional farming, fishing and livestock. Wet rice production in the south, and secondary food crops in the central highlands.
Dili	371	142408	Lowland hilly throughout. Very dry, but still fertile soils.	Traditional farming and trading.
Aileu	729	28375	Highland area of hills and valleys, with perennial streams.	Farming of coffee, corn and rice. Animal production.
Liquica	548	50337	Hilly, with flatlands on some of the coastal area. Receives rains sufficient for agricultural production once a year.	Mainly coffee plantations in the hills, else traditional agriculture. Some minor production of derived agricultural produce, ex. palm leaf and tuak (alcoholic drink from palm). Sandalwood in the highlands.
Ermera	746	86337	Hilly with valleys and fertile soils. Rainy season is January through April, dry months in June until October.	Traditional farming with coffee as an important crop. Irrigated rice and dryland farming of rice and corn, with some raising of pigs and goats.
Bobonaro	1368	88241	Wide mountainous uplands and open lowlands. Deforested highlands. Some perennial rivers, relative small rainfalls but still fertile.	Traditional farming with some livestock. Balinese farmers have introduced more intensive farming. Considered being of importance for Timorese future food production due to high fertility potential. Main producer of kidney bean in East Timor.
Ambeno	814	52509	Mostly mountainous, few lowland areas.	Traditional agriculture, mainly cattle husbandry and food crops.

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Summary

This working paper came about as a result of background research for a chapter in *Social and Economic Conditions in East Timor*, published by the International Conflict Resolution Program, School of International and Public Affairs, Colombia University, New York, USA (Pedersen 1999). The paper has been available in its existing form from late 1999.